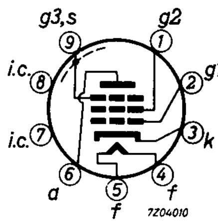
S.Q. TUBE

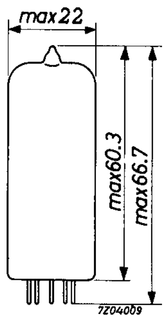
Special quality pentode designed for use in telephone equipment.

QUICK REFERENCE DATA			
Life expectancy	10 000 hours		
Low interface resistance			
Base	Noval. Gold plated pins		
Heating	Indirect A.C. or D.C. Series or parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	0.3	A
Anode current	I_a	10	mA
Mutual conductance	S	9	mA/V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS

Column I Nominal value or setting of the tube.
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	300	285 - 315		mA
Anode voltage	V_a	210			V
Grid No.3 voltage	V_{g3}	0			V
Grid No.2 voltage	V_{g2}	120			V
Cathode resistor	R_k	165			Ω
Anode current	I_a	10	8.7 - 11.3	7	mA
Grid No.2 current	I_{g2}	2.1	1.7 - 2.5	1.25	mA
Mutual conductance	S	9	7.8 - 10.2	6.4	mA/V
Internal resistance	R_i	0.5	min. 0.3		MΩ
Amplification factor grid No.2 to grid No.1	$\mu_{g_2g_1}$	38			
Equivalent noise resistance (R.F.)	R_{eq}	750	max.1000		Ω
Equivalent noise resistance (A.F.)	R_{eq}		max. 36		kΩ
Negative grid No.1 current	$-I_{g1}$		max. 0.5	max.1.0	μA
Hum voltage	V_{g1}		max. 0.5		mV_{RMS}
Grid resistor R_{g_1} = 0.5 MΩ					
Cathode resistor by passed					
Cut off voltage	$-V_{g1}$	5	max.5.25		V
Anode voltage	V_a	210			V
Grid No.3 voltage	V_{g3}	0			V
Grid No.2 voltage	V_{g2}	120			V
Anode current	I_a	0.5			mA

CHARACTERISTICS (continued)

		I	II	III	
Leakage current between cathode and heater Voltage between heater and cathode V_{kf} = 100 V	I_{kf}		max. 15		µA
Insulation resistance between two arbitrary electrodes Voltage between electrodes V = 250 V	R		min. 100		MΩ

CAPACITANCES

Radiation capacitances measured to a surrounding cylinder, internal diameter 52 mm, height 98 mm.

		I	II	
Grid No.1 to grid No.2, grid No.3, cathode, heater and screen	C_{g_1/g_2g_3kfs}	8	8.7	pF
Grid No.1 to grid No.2, grid No.3, cathode, heater and screen Cathode current = 12.1 mA	C_{g_1/g_2g_3kfs}	10.8		pF
Anode to grid No.2, grid No.3, cathode, heater and screen	C_{a/g_2g_3kfs}	3.5	max. 4.1	pF
Anode to grid No.1	C_{ag_1}		max. 15	mpF
Grid No.1 to heater	C_{g_1f}		max.0.15	pF
Cathode to heater	C_{kf}	4		pF
Grid No.1 radiation capacitance	C_{rg_1}	max.25		mpF
Anode radiation capacitance	C_{ra}	max.25		mpF

LIFE EXPECTANCY

When the tube is operated under the following conditions the range values of the characteristics in column III may be expected not to be exceeded during an operation period of 10 000 hours.

Anode voltage	V_a	210	V
Grid No.3 voltage	V_{g_3}	0	V
Grid No.2 voltage	V_{g_2}	120	V
Cathode resistor	R_k	165	Ω

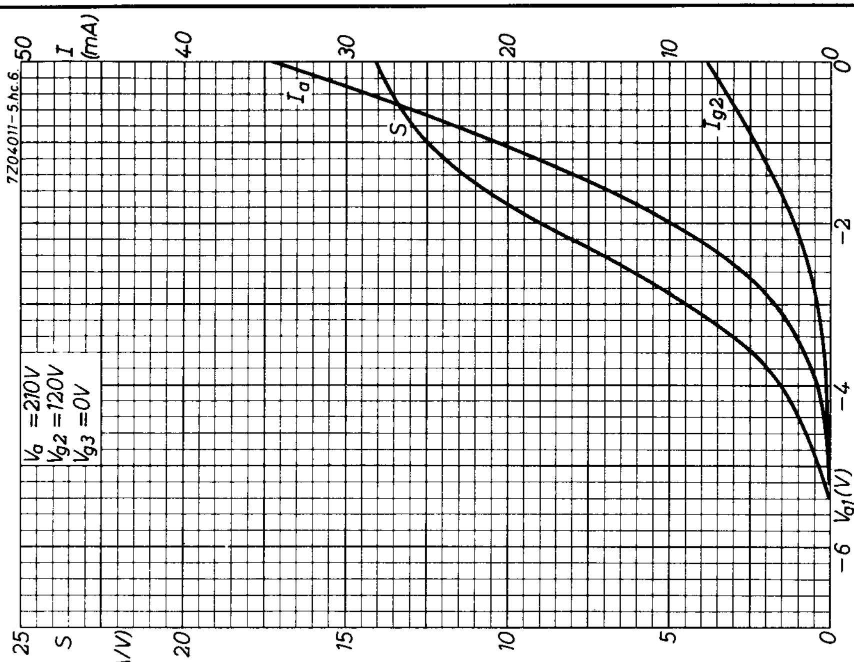
LIMITING VALUES (Design centre rating system)

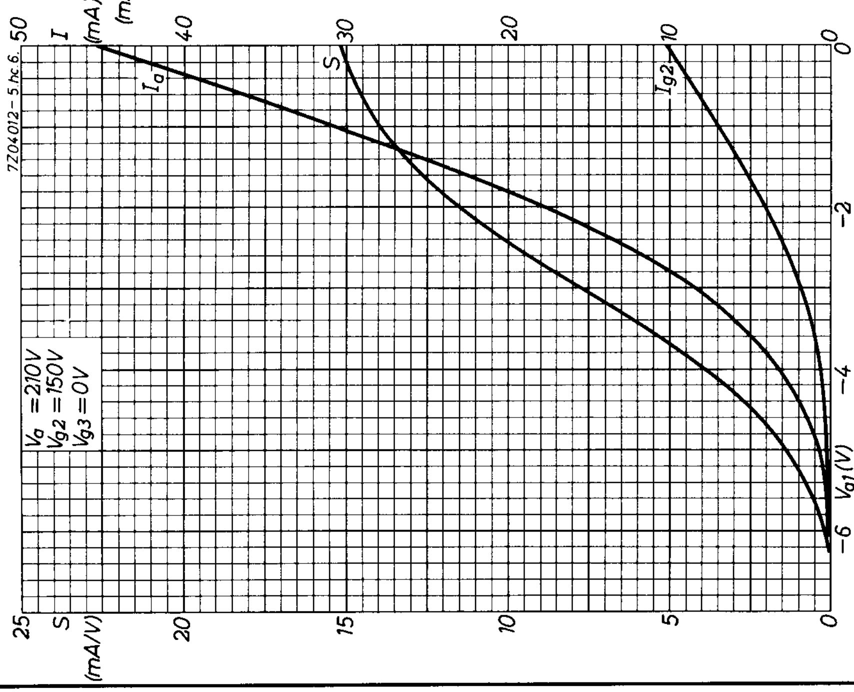
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	210	V
Anode dissipation	W_a	max.	2.1	W
Grid No.2 voltage	$V_{g_{2o}}$	max.	550	V
	V_{g_2}	max.	210	V
Grid No.2 dissipation	W_{g_2}	max.	0.35	W
Grid No.1 voltage	$-V_{g_1}$	max.	100	V
Grid No.1 voltage, peak	$-V_{g_{1p}}$	max.	200	V
Duty factor max. 0.1				
Pulse duration max. 200 μs				
Grid No.1 dissipation	W_{g_1}	max.	50	mW
Grid No.1 resistor (automatic bias)	R_{g_1}	max.	1	MΩ
Cathode current	I_k	max.	16	mA
Cathode current peak value	I_{k_p}	max.	80	mA
Duty factor max. 0.1				
Pulse duration max. 200 μs				
Voltage between heater and cathode	V_{kf}	max.	100	V
Bulb temperature (absolute maximum)	t_{bulb}	max.	170	°C

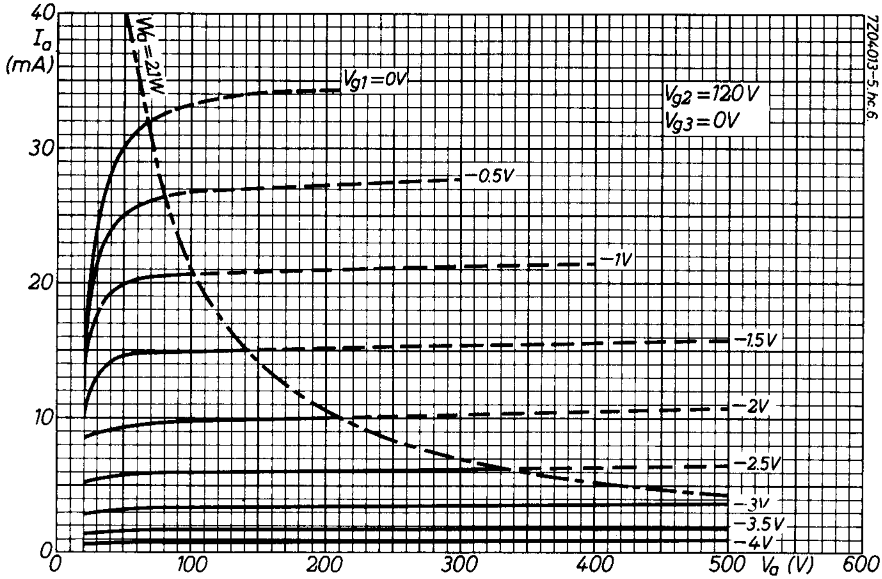
OPERATING CHARACTERISTICS

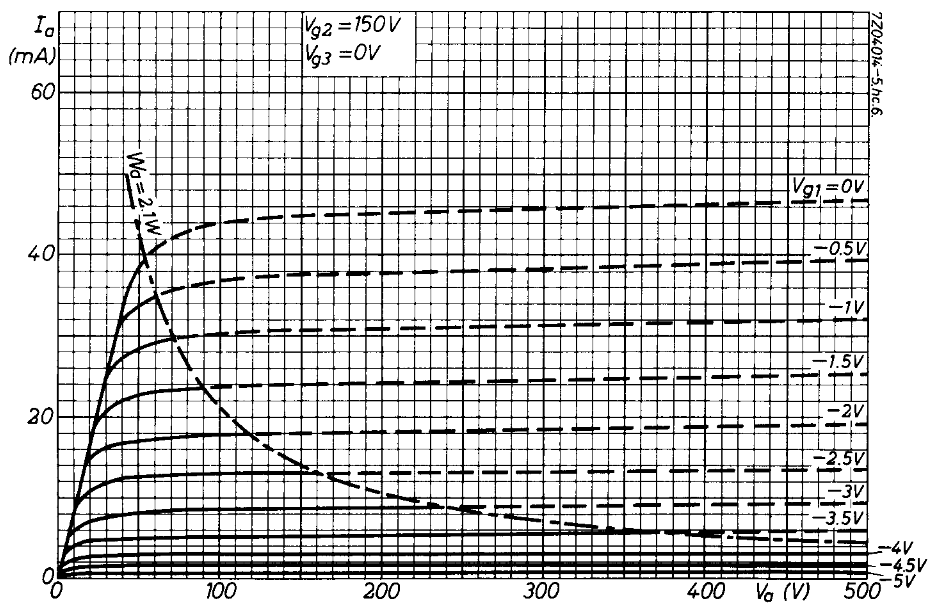
Output tube. Class A

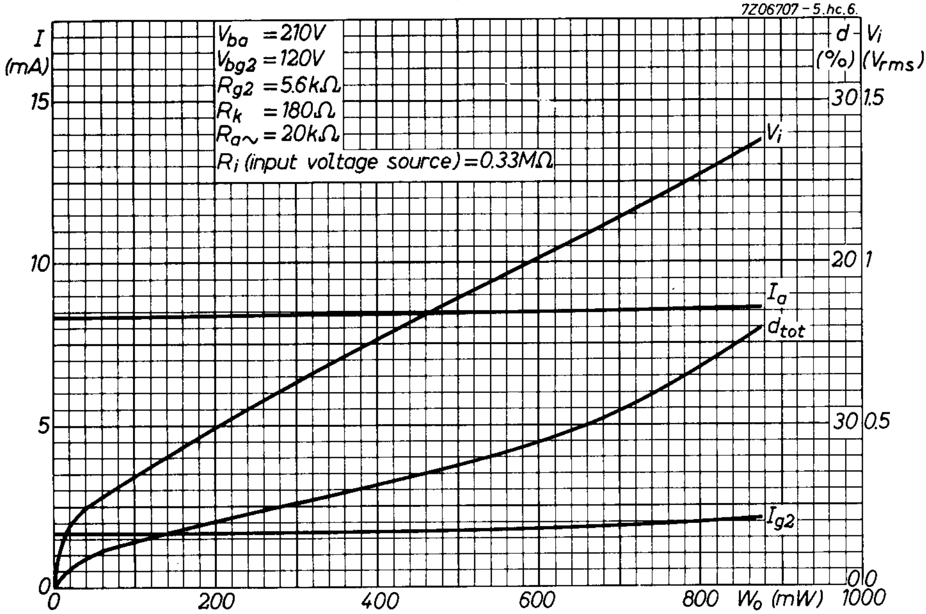
Anode voltage	V_a		120			210		V
Grid No.3 voltage	V_{g_3}		0			0		V
Grid No.2 supply voltage	V_{bg_2}		120			120		V
Grid No.2 resistor	R_{g_2}		5.6			5.6		kΩ
Cathode resistor	R_k		180			180		Ω
Anode current	I_a		8.3			8.3		mA
Grid No.2 current	I_{g_2}		1.7			1.7		mA
Mutual conductance	S		8.2			8.2		mA/V
Internal resistance	R_i		0.42			0.44		MΩ
Load resistance	$R_{a\sim}$		10			20		kΩ
Input voltage	V_i	0.35	1.1	-	0.25	1.1	-	V_{RMS}
Grid No.1 current	$+I_{g_1}$	-	-	0.3	-	-	0.3	μA
Grid No.1 resistor	R_{g_1}	-	-	0.33	-	-	0.33	MΩ
Total distortion	d_{tot}	-	10	-	-	10	-	%
Output power	W_o	50	340	400	50	660	870	mW

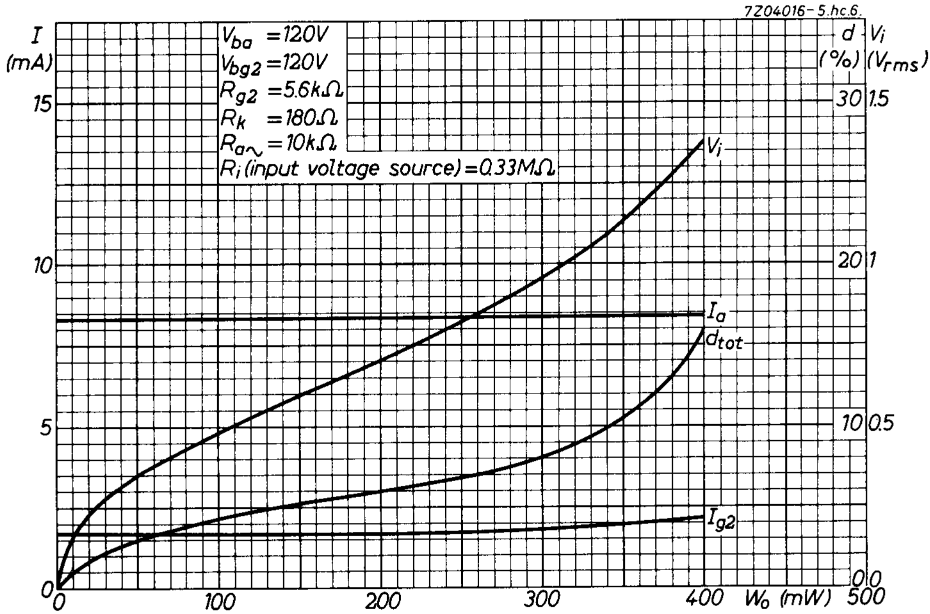

7Z04011-5.hc.6.
I (mA)
S (mA/V)
I_a
S
I_{g2}
V_{g1}(V)
V_a = 210V
V_{g2} = 120V
V_{g3} = 0V

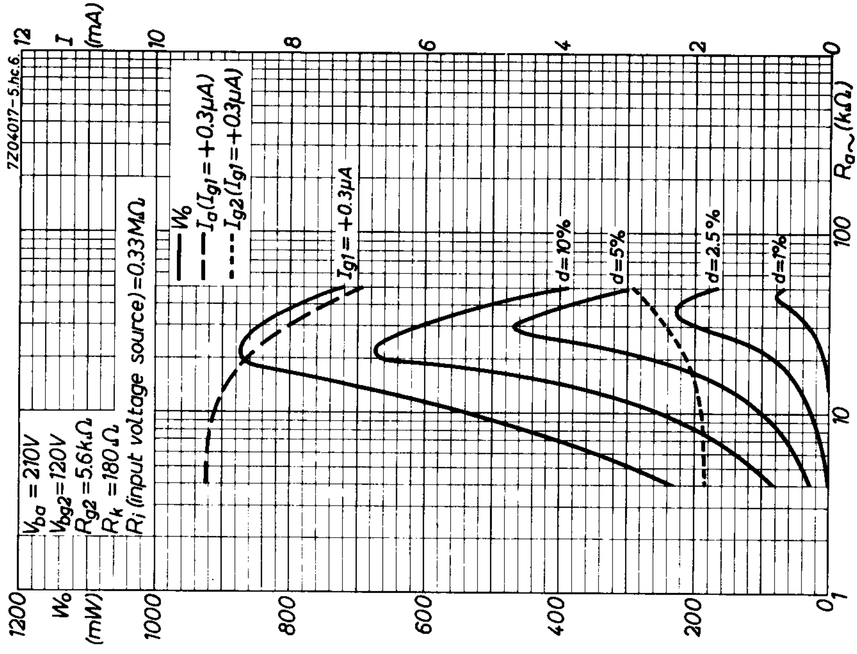

7Z04012-5.hc.6.
I (mA)
S (mA/V)
I_a
S
I_{g2}
V_{g1}(V)
V_a = 210V
V_{g2} = 150V
V_{g3} = 0V

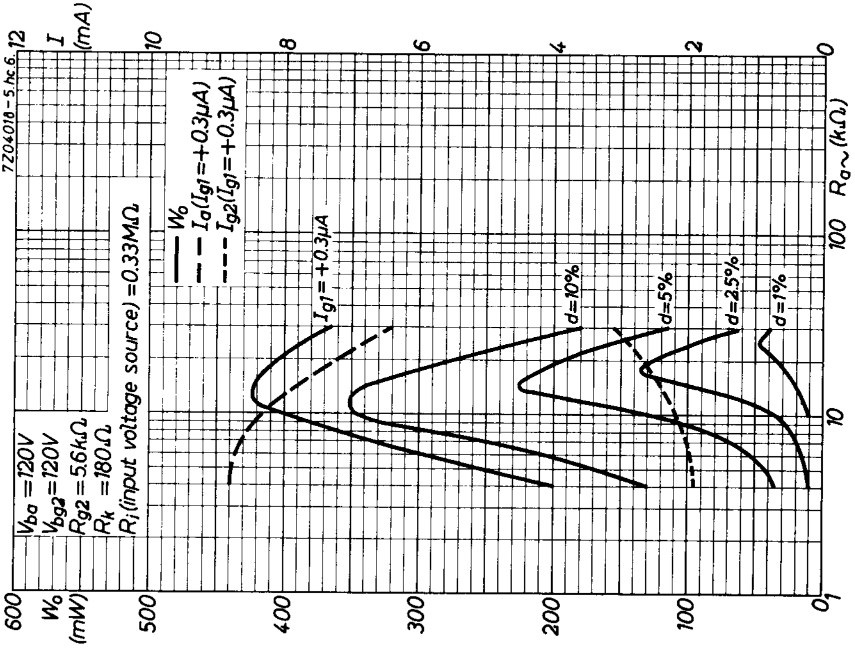

40
I_a
(mA)
30
20
10
0
0
100
200
300
400
500
V_a (V)
600
V_{g1}=0V
−0.5V
−1V
−1.5V
−2V
−2.5V
−3V
−3.5V
−4V
W_a=2.1W
V_{g2}=120V
V_{g3}=0V
7Z04013-5.hc.6.

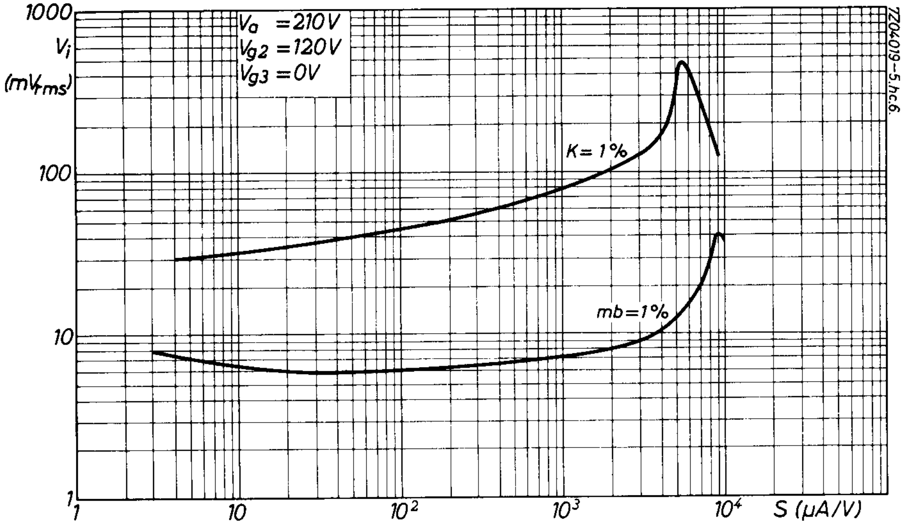

I_a
(mA)
60
40
20
0
0
100
200
300
400
V_a (V)
500
V_{g2}=150V
V_{g3}=0V
W_a=2.1W
V_{g1}=0V
−0.5V
−1V
−1.5V
−2V
−2.5V
−3V
−3.5V
−4V
−4.5V
−5V
7Z04014-5.hc.6.

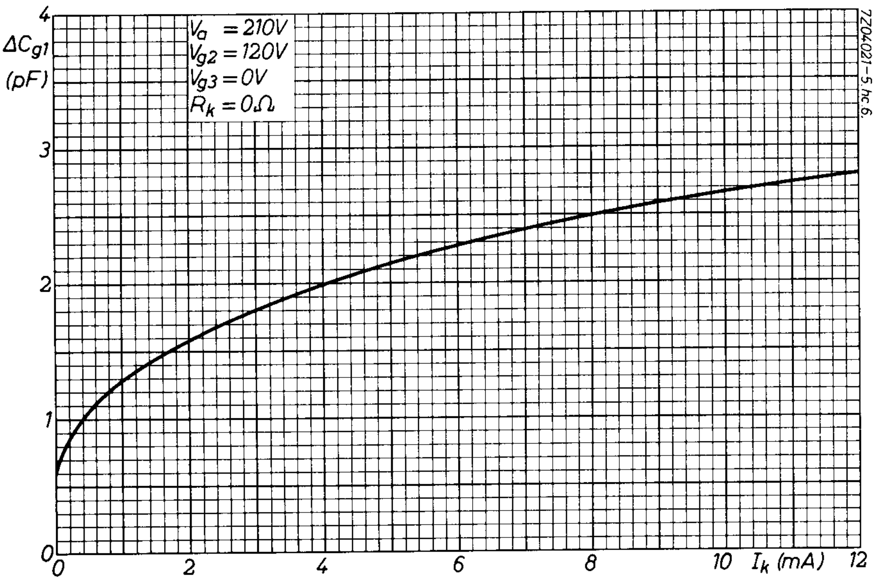

7Z06707 – 5.hc.6.
I
(mA)
V_{ba} = 210V
V_{bg2} = 120V
R_{g2} = 5.6kΩ
R_k = 180Ω
$R_{a\sim}$ = 20kΩ
R_i (input voltage source) = 0.33MΩ
d
(%)
V_i
(V_{rms})
V_i
I_a
d_{tot}
I_{g2}
W_o (mW)
0
5
10
15
200
400
600
800
1000
30
20
1.5
1
0.5
0

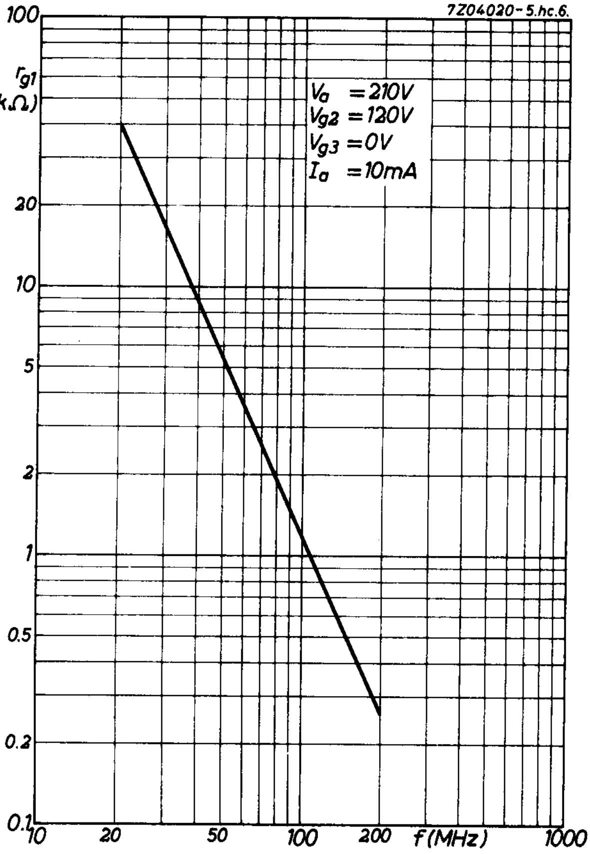

7Z04016 – 5.hc.6.
I
(mA)
V_{ba} = 120V
V_{bg2} = 120V
R_{g2} = 5.6kΩ
R_k = 180Ω
$R_{a\sim}$ = 10kΩ
R_i (input voltage source) = 0.33MΩ
d
(%)
V_i
(V_{rms})
V_i
I_a
d_{tot}
I_{g2}
W_o (mW)
0
5
10
15
100
200
300
400
500
30
20
10
1.5
1
0.5
0


7Z04017-5.hc.6.
Vba = 210V
Vbg2 = 120V
Rg2 = 5.6kΩ
Rk = 180Ω
Ri (input voltage source) = 0.33MΩ
Wo
Ia(Ig1 = +0.3μA)
Ig2(Ig1 = +0.3μA)
Ig1 = +0.3μA
d=10%
d=5%
d=2.5%
d=1%
Wo (mW)
I (mA)
Ra~(kΩ)
1200
1000
800
600
400
200
0
12
10
8
6
4
2
0
1
10
100


7Z04018-5.hc.6.
Vba = 120V
Vbg2 = 120V
Rg2 = 5.6kΩ
Rk = 180Ω
Ri (input voltage source) = 0.33MΩ
Wo
Ia(Ig1 = +0.3μA)
Ig2(Ig1 = +0.3μA)
Ig1 = +0.3μA
d=10%
d=5%
d=2.5%
d=1%
Wo (mW)
I (mA)
Ra~(kΩ)
600
500
400
300
200
100
0
12
10
8
6
4
2
0
1
10
100


1000
V_i
(mV_{rms})
100
10
1
1
10
10^2
10^3
10^4
S (μA/V)
V_a = 210 V
V_{g2} = 120 V
V_{g3} = 0 V
K = 1%
mb = 1%
7Z04019-5.hc.6.


4
ΔC_{g1}
(pF)
3
2
1
0
0
2
4
6
8
10
I_k (mA)
12
V_a = 210 V
V_{g2} = 120 V
V_{g3} = 0 V
R_k = 0 Ω
7Z04021-5.hc.6.


7Z04020-5.hc.6.
100
r_{g1}
(kΩ)
V_a = 210V
V_{g2} = 120V
V_{g3} = 0V
I_a = 10mA
20
10
5
2
1
0.5
0.2
0.1
10
20
50
100
200
f (MHz)
1000

PHILIPS

Data handbook

Electronic components and materials

E83F

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11	FP	2000.11.19